DOCUMENT RESUME

) 157 813	SO 010 983
UTHOR	Blum, Mark; Spangehl, Stephen
ITLE	Developmental Education and the University College: A Competency-Based Approach to Education.
UB DATE	Nov 76
OTE	82p.
DRS PRICE	MF-$0.83 HC-$4.67 Plus Postage.
ESCRIPTORS	Affective Objectives; Behavioral Objectives; Cognitive Objectives; Curriculum Design; *Curriculum Development; Educational Improvement; Educational Needs; *Educational Objectives; Educational Practice; Higher Education; Human Development; Humanities; Humanities Instruction; *Interdisciplinary Approach; Knowledge Level; Learning Modules; Natural Sciences; *Performance Based Education; Process Education; *Program Descriptions; Program Development; Relevance (Education); Remedial Instruction; *Skill Development; Social Sciences; Values

BSTRACT

Developmental education can help college-level urriculum planners identify competency objectives in social ciences, humanities, and the natural sciences. Developmental ducation is interpreted as learning that helps an individual develop he abilities necessary for pursuing personal and social goals. bilities, differing at each stage of human growth, include ognitive; affective; interpersonal; social; moral ethical; and sychomotor. Modules based on developmental education concepts nclude a variety of objectives, materials, and skills which can be earranged to meet individual student needs. Modules should be ollected in a library so that they can be integrated into other ourses and used as independent study resources. For each module, nformation should be available on objectives, entry level knowledge equired, staff requirements, materials, and time necessary to omplete the module. The conclusion is that the type of ompetency-based training encouraged by developmental education is seful in helping students develop academic and daily life skills. Author/DB)

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DEVELOPMENTAL EDUCATION AND THE UNIVERSITY COLLEGE:

A COMPETENCY-BASED APPROACH TO EDUCATION

Mark Blum
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November, 1976

SO 010 982

Preface

This document represents a philosophy and structure for developmental, competency-based education as we believe it should develop in University College. The program which will be erected on this basis will set as its goal the establishment in students of competencies in the methods of acquiring, producing, and using knowledge in the humanities, social sciences, and natural sciences. Enabling the student to actualize his or her ideas, values, and knowledge in behavior and actions is a major principle underlying the entire program. The program will attempt to foster the student's independence through a carefully structured sequence of educational experiences which lead to demonstratable competencies, visible both to the student and others. We believe the program based on these objectives and principles will provide an effective means for: (1) meeting the need of students with competencies inadequate to pursue traditional college work; (2) providing a skill-based rational for interdisciplinary studies; (3) removing the stigma now attached to 'remedial' education by providing a smooth transistion from basic through general and advanced studies, a continuum based on skill development; and (4) responsibly addressing the needs justly created by the demand for equal opportunity in education.

We wish to thank all those in University College who have made it possible for us to begin this task, and to express our indebtedness to all those, both within and outside the College, who have helped us in defining and designing our program.

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WHAT IS DEVELOPMENTAL EDUCATION?

DEVELOPMENTAL EDUCATION AND THE UNIVERSITY COLLEGE: A COMPETENCY-BASED APPROACH TO HIGHER EDUCATION

A. What is Developmental Education?

Developmental education is learning that enables the individual to develop the range of human abilities requisite for adequate and innovative performance in human culture. Developmental education seeks to identify the stages of human growth and the ability levels consonant to a stage of growth; it seeks to create educational treatments that will nourish a stage of growth and the abilities which are present in that stage.

Even an infant is engaged in the acquisition, production, and utilization of knowledge: one of the major concerns of developmental education from infant education through college education to professionally advanced education is the development of the skills of knowledge acquisition, production, and utilization. The range of human skills in the pursuit, creation, and use of knowledge are fundamental to competent life in the world.

The competent person is the person who is able to direct and effectively operate his full range of abilities. Competency in the governing of a personal life, which includes responsibility towards others and the society in which one lives, has become increasingly a goal of education in Western culture. It was not always so: Immanuel Kant was one of the first thinkers in Western culture to state that human competency for everyone was the prime goal of human development. Not until the latter part of the 18th century was this

goal clearly articulated. Immanuel Kant knew why the idea of human competence came so late in Western civilization:

> The step to competence is held to be dangerous by the far greater portion of mankind (and by the entire fair sex)--quite apart from its being arduous--because of the resistance of those who have power over the people.

Competency requires a base of equal opportunity and the other principles and sanctions of freedom which began to be articulated in America at the time of Kant, but which has had to await the late 20th century to really emerge as a fact as well as a body of principles.

Kant felt that Enlightenment itself was competency: the ability to use one's knowledge and abilities to direct one's steps in life. Yet, Kant was well aware how few persons allowed themselves to realize their full potential because of the habitualities of culture that made persons lean on the direction of another:

> Enlightenment is man's release from his self-incurred tutelage. Tutelage is man's inability to make use of his understanding without direction from another. Self-incurred is this tutelage when its cause lies not in lack of reason but in lack of resolution and courage to use it without direction from another. Sapere aude! "Have courage to use your own reason!"--that is the motto of enlightenment.

> Laziness and cowardice are the reasons why so great a portion of mankind, after nature has long since discharged them from external direction, nevertheless remains under lifelong tutelage, and why it is so easy for others to set themselves up as their guardians. It is so easy not to be of age. If I have a book which understands for me, a pastor who has a conscience for me, a physician who decides my diet, and so forth, I need not trouble myself. I need not think, if I can only pay--others will readily undertake the irksome work for me.

Even today these norms of relying on the experts to plan our everyday realities are prevalent. Even today developmental education, which seeks to

actualize the many human abilities of thought, emotional control, physical dexterity, moral vigor, and social leadership, is but a small part of the educational system which still feels that some should be schooled in the mind to be white collar workers and some in their physical prowess to be blue collar workers. We still do battle with those who think that some people are born Alphas and some Epsilons, and that a few are born to superintend the whole.

We no longer live in a society that accepts class, race, or ethnic distinctions within the marketplace of opportunity, yet our educational methods and goals still reflect an inability to provide adequate education for the competencies required in realizing freely chosen personal and social goals. Educating for interpersonal and social skills which enable cooperative projects and an empathy which assures a respect for individual worth and equal opportunity is but a small concern in the curricula of elementary, secondary, and higher education. Educating for the affective and ethical-moral skills which enable the person to develop a strong, flexible identity, and articulated values which can serve for lifelong freedom of choice and action, is of growing concern to educators, but still not a core of curriculum.

The tasks confronting developmental education are enormous would it fulfill its cultural mission. It must review human activity and determine the major domains of human ability with an accuracy which will allow treatment and assessment of the skills. It must create diagnoses and treatments of skill needs from the nursery age through professional maturity would it realize its goal of putting American educational programs in a competency-based system. A competency-based system of education is, however, the only educational system which can move America towards meeting the social-political realities required by an equality of opportunity that really works.

We do not all start in the same place culturally in the modern democratic world of America. Some groups of individuals have been favored with more of an opportunity for the development of human abilities requisite for healthy individuation. The poor of America, the culturally disadvantaged, the crowded populations who have been raised in urban blight, these people often need developmental remediation in human abilities skewed or stunted by the pressure and neglect of social conditions and educational settings. Developmental education seeks to identify the major kinds of human skills, and the levels of adequate performance for certain ages, so as to be able to prescribe educational treatments that can correct and compensate dimensions of human ability that are suffering from neglect.

Yet developmental education--the development of the whole range of human abilities requisite to a balanced realization of full human potential--is not only for the "deprived" and the "disadvantaged" of minority students. The majority of American middle and upper classes, too, have suffered in their skill development because of the lack of interpersonal, social, affective, and ethical-moral skill growth. The majority culture has not educated individuals in the skills for cooperative and social competence. Few Americans have the balanced skill range which can cope with the exigencies of a political-social world that demands accurate empathy, ability to create policies and projects for multi-ethnic populations, and to care actively for the daily <u>interdependent</u> realities of an urban culture. We can no longer socialize with only our own economic class or ethnic fellows to avoid realizing the personal skill deficiencies that result from our educational system.

All of us need special attention to the development of the full range of human competencies necessary for balanced individuation and interdependent

responsiveness. Remediation for we who are older. Careful curriculum planning from nursery school through higher education for the coming generations. Competency is demanded of each of us today. We must find solutions which integrate people, places, and things: each one of us must enable this integration to occur. This will require the intellectual, emotional, interpersonal, social moral-ethical, and physical skills of each one of us operating as effectively as possible.

Thus, developmental education is highly interested in social-political realities of an urban world. The earliest thinkers in developmental education, such as John Dewey, spoke for the development of competencies in interpersonal relations, inquiry skills, and leadership skills which might enable an effective equality in America's population. Interdependent demands of the city and the technological age in general were uppermost in the competency-based learning designs created by American developmentalists.

The developmentalists, thus, are pragmatic. When John Dewey looked at the purpose of education, he saw that individuals must learn how to apply knowledge to solve problems. Developmental education includes the goals for educating persons into the many abilities needed for acquiring, producing, and utilizing knowledge. Dewey's efforts to identify the procedures basic to the acquisition, production, and utilization of knowledge, his concern with integrating these procedures into a person's life with care for individuality, and his insistence that all human ability development enable a person to form effective solutions to life's problems set the tone for later movements within developmental education.

Since Dewey, educators and psychologists have focused in increasing numbers upon the problems of identification of the spectrum of human abilities

that underlie human performance in the world, and the best ways in which to develop these competencies in the person. Public education increasingly relies on the criteria and methods provided by developmentalists in their attempt to adequately educate towards effective, responsive citizenship.

Researchers such as Jean Piaget, Eric Erickson, Jane Loevinger, A. Gesell, Benjamin Bloom, Louis Kratwohol,Louis Raths, Robert Havighurst, Lawrence Kohlberg, Anita Simon, Russell Hill, David McClelland, Milton Meux, Margaret Mead, and many other prominent persons in sociology, educational psychology, anthropology, ethnology, and many other fields, have enriched developmental education by exploring the stages of human growth, the domains of human ability, and, either have indicated principles or developed treatments for furthering skill development in each domain of human ability for every major period of maturation.

Six major domains of human ability have recurred in the thinking and research of those involved in developmental education--those areas of human ability which can be treated in an educational setting: cognitive abilities, affective abilities, interpersonal abilities, social abilities, moral-ethical (value actualization) abilities, and psycho-motor abilities. These six domains are integrated to some degree in every human action. Learning to live in the society means learning to integrate these six human ability domains into responses to self needs and the needs of others. We teach persons <u>procedures</u> at every level of maturation which enable an integration of these six domains for specific cultural purposes. Coping with the upkeep of one's house or solving a pollution problem, participating in a student government or running a small, hardware store, taking a mathematics test or giving someone directions to the next town, all of these many acts involve socially learned procedures which integrate the six domains of human ability into one human response.

Below are short definitions of these six domains of human abilities. Under each domain is included examples of procedures which organize the abilities primarily identified with that domain into effective human responses.

The Six Human Ability Domains

1. Cognitive abilities: the mental operations, which include memory, awareness, perception, comprehension, reasoning, introspection, imagination, judgement, and reflection.

Selected cognitive procedures: methods of reasoning, such as analogy and syllogism; methods of judgement, based upon analysis and inference, methods of comprehension, such as extrapolation, translation, and interpretation; methods of introspection, such as a causal analysis of events or identity formulation by logical criteria.

2. Affective abilities: ability to express, identify, and govern one's own emotions, and the ability to relate to the emotional life of another with accurate empathy (which includes the ability to identify and support the emotional expression of others).

Selected affective procedures: methods for observing and categorizing emotional flux into identifiable elements; methods for maintaining contact with an emotion; methods for predicting actions in others based on accurate empathic understanding.

3. Interpersonal abilities: communication and participational abilities which establish interaction, mutual understanding, and cooperation with others.

Selected interpersonal procedures: methods for listening and recording information from others; methods for determining optimum synergy in cooperative activity; methods for determining a common language for team creativity.

4. Social abilities: communication and participational abilities in association with others which establish interaction and cooperative activities that satisfy personal and public goals.

Selected social procedures: methods for leading groups in the identification of goals and the organization of labor; methods for project planning and mangement; methods for initiating, facilitating, and maintaining project efforts among a group.

5. Moral-ethical (value actualization) abilities: abilities which enable a person to determine a right or wrong personal action or position. Abilities which enable the person to identify interests and values, guide their actualization in the everyday environment, and sustain project based upon the values and interests.

The ability to maintain a strong, flexible personal identity which will enable a person to recognize personal strengths in daily activity and maintain a continutity of identity and personal effectiveness are included in this domain.

Selected moral-ethical (value actualization) procedures: methods for identifying values in one's life world; methods for determining the criteria upon which one forms a personal identity; methods for determining the congruence between personal values and their actualization in everyday activities.

6. Psycho-motor abilities: fine-motor and locomotor skills, such as those developed in fine arts and dance.

Selected psycho-motor procedures: Procedures in physical-mental development which further relaxation in the midst of pressure situations, which further accurate empathic response to physical cues of others, and which further a continual contact and ability to respond appropriately to one's bodily needs.

How Human Abilities are Exercised and Identified in Purposive Activity

The task in contemporary education at every school level is to develop educational treatments which will further skill growth in each of these six domains of human ability. None of these six domains, however, is expressed by itself in human behavior.

Every human act is an integration of cognitive, affective, social, interpersonal, ethical-moral, and psycho-motor abilities. Every act, a combination of the six ability domains, is unified in its articulation in the world. A single action has its worldly intention and coherence based on the sequence of acts in which the one act occurs. This is a condition of life in time. A sequence of human acts organized for human purpose is called a procedure when it is consciously used for effecting its purpose. Developmental education is concerned with identifiable expressions of human ability. Procedures have duration in time and, usually, a purpose that can be defined. Thus, procedures are more visible, identifiable, and measurable in their occurrence in the world than the isolated moment of the expression of a human ability. The expression of a particular domain of ability can be seen in a procedure which is weighted heavily with the abilities from that domain: for example, in studying the cognitive abilities of a person, viewing the procedure of comparing one thing to another will enable an identification of the person's reasoning ability;

in studying the affective abilities of a person, observing the procedure the person uses in identifying and governing emotional expression will indicate his ability in this domain. The procedures by which a person interacts with his environment, that is, the act sequences by which he moves in time to effect his purposes, are the evidence the educator has to determine the range and degree of human abilities on hend for the individual studied.

The investigation of human ability in school settings is directed to those procedures which are used in the pursuit of knowledge and personal development.

Identifying the procedures of knowledge acquisition, production and utilization which organize and integrate the human abilities of the cognitive, affective, interpersonal, social, ethical-moral, and psycho-motor domains into balanced, effective methods for accomplishing human ends has always been, the prime purpose of education. Developmental education has only clarified and sharpened the concern of education with the procedures involved in the acts of knowledge. I nursery, elementary, secondary, and college educational situations, effective procedures in conducting inquiry and discovery, and utilizing knowledge are being developed by educators informed by developmental educational criteria. The growth of human ability is furthered in this attention to procedural development.

Persons are schooled in the procedures of dealing with the world, self, and others, procedures which permit a full range of human abilities to flourish. Individuation is the unfolding of human ability through procedural development.

The acquisition of information and ideas in any field is not the sole end of education in a system informed by developmental education (becoming 'learned lumber' as the Englishman Bolingbroke expressed the narrow goals of higher

education in his time); rather, information and ideas are best learned within a field in conjunction with the methods by which the information and ideas can be utilized in the operational reality of the individual.

The acquisition of knowledge in any field must be complemented by knowledge production and knowledge utilization would a human life be fully expressed and developed. The "procedural dimensions" of knowledge acquisition, production, and utilization include the "material" of information and ideas in any field, as well as every method whereby information and ideas are processed by the individual, integrated into his personal life, and in his relation to the world.

The concept of "procedural dimension" allows one to see the many methods whereby knowledge in any area is processed as that which is acquired, used as bases for personal production of ideas and procedures, and utilized in the course of one's life in the world. Teaching towards competency in the essential procedural dimensions of knowledge highlights the methods which every discipline employs, in one systematic form or another, of acquiring, producing, and utilizing its ideas and information.

The acquisition of knowledge in the Social Sciences, Humanities, or Natural Sciences includes procedures which are common to each of these major divisions of human knowledge. Acquiring knowledge involves the methods of inquiry developed by the human species over its history of experience in the world. The human make-up of abilities and faculties has determined the essential elements of the acquisition stage of knowledge development; man uses language to frame questions, man uses his senses and motility in the conduct of inquiry to establish facts, man has a memory and other store houses of information which provide a background of knowledge acquisition which are part of every domain of science. The list

of acquisition methods on the following page can be seen as belonging to any adequate education in the Natural Sciences, Humanities, or Social Sciences. These methods of knowledge acquisition are the backbone of a developmental education within the discipline in which they are practiced.

The production of knowledge in the major scientific fields, which includes Humanities, involves again, those methods which mankind has developed to suit his organic makeup and the conditions of life on earth. Man must be able to use an individual set of cognitive and physical tools in any personal search for the solution to a problem and in the establishment of a solution to a problem. Man must learn to translate information about things which he has learned from others into viable tools and procedures which enable him to conduct his search in his immediate surroundings. Morever, whatever he discovers is evidence or fact only to him until he is able to communicate his results to another in a form that is not only convincing, but capable of being demonstrated yet again to a third party. Objectivity, replicability, cultural utility all depend upon an individual learning how to package and communicate the facts established in a personal search. The truths involved in the human act of producing knowledge not known before are part of the human condition. The imperatives involved in knowledge production, and the methods individuals have developed in culture to establish knowledge and production, as in knowledge acquisition, rely on the nature of the human mind, the human senses, and the contingencies of human motility and life in the world. The list of production methods below may not exhaust the particular methods in any discipline or field, but they suggest the many considerations developmental education brings to the human conduct of knowledge production.

The utilization of knowledge in the Social Sciences, Humanities, and Natural Sciences varies according to the cultural state of the world in the given epoch. Some fields of knowledge go about making discoveries and are not called upon by the social world to contribute with their knowledge to effecting improvement in the society. I suspect that if we talk about individual investigators in any field, we will see that every person wants to make use of his discoveries, and that this has been true in every epoch. Some men never learn how to implement what they discover in a cultural application that works. The survey below of utilization methods by which knowledge can be implemented for cultural gain is a list of methods which are relevant to the sciences in every discipline. The methods are required, again, because of the nature of the human being and the conditions of life in the world. Certain bases must be touched in any attempt by a science to implement its discoveries in existing cultural systems. Certain skills must be learned by an individual if he would effect his discovery in actual use among the ongoing operations of his fellows.

Acquisition

Acquiring existing information information:

--learning sources for research in the field

--learning vocabulary of the field

--learning principle investigators within the field

--learning key ideas within the field

(Acquisition Cont.)

--learning the history of ideas, sources for research, and principle investigators in the field

--learning the parameters of the field historically & presently

--learning the forms and styles in which hypotheses, theories, and laws are expressed in the field.

Acquiring the methods for individual search in the field:

--learning the existing perspectives and approaches for developing facts in the field

--learning the forms for articulating problems, hypotheses, theories, and laws appropriate for one's area of research

--learning how to establish a scope of search

--reviewing personal assumptions and search criteria

--learning evaluation methods relevant to search

--learning the methods of data collection, classification, and other organizational modes adequate for actual investigation.

Acquiring the methods of knowledge application and communication (utilization):

--learning how ideas, theories, and laws in the field have been historically used in cultural projects

--learning the current methodological utility of ideas, theories, and laws in the field to present cultural problems

--reviewing the interdisciplinary cooperation of the field with other fields in cultural projects in terms of ideas, methods, and technologies

--isolating tools (methods of inquiry, methods to effect changes, methods to establish purposes) of the discipline which can be used in cultural projects

--learning the customary formats of communication used by the field.

Production

Producing thematic organization for focusing individual search in a field

--learning to identify thematic interests in a field

--learning to articulate problem statements which will guide and facilitate personal search

--learning how to construct hypotheses which may be evaluated

--learning how to select existing methods of inquiry and data collection, and how to plan an augmentation and innovation in the conduct of inquiry and data collection to accomodate personal search problems

--learning the existing criteria in the field for valid and reliable experimentation.

Producing methods appropriate for the conduct of an individual search:

--practicing the psycho-physical steps in the conduct of experimentation

--practicing the application of data collection categories, measures and other criteria in the midst of experimentation

--learning the models in one's field for theory development and the expression of laws

--practicing theory development on the basis of verified hypotheses.

Producing personal methods of knowledge application and communication (utilization):

--Practicing the written and oral communication of facts, hypotheses, theories, and laws in one's field.

--Develop a genre of expression appropriate and effective for communicating one's area of search and discovery

--Practicing demonstration to laymen and professionals in various fields

--Identifying areas of culture (people, technology, institutional organization) which might benefit from knowledge of the facts or application of the procedures in your discovery

--Refining problem statements and applications of your discoveries adequate for solving the problem statements

--Developing plans for implementing solutions in the environment that you wish to affect.

Utilization

Acquiring the established methods and history of cultural implementation of the discoveries of the field, and the forms in which knowledge in the field has been communicated:

--survey of the field's history of technologies and its applications

--survey of the individual scientists in the field in terms of their method and style of communicating and demonstrating discoveries.

Producing culturally useful tools and applications based on the discoveries of your search:

--Learning to develop tools and applications of experimental discoveries in pilot tests and extensive field tests.

--Learning the group dynamics and interpersonal skills requisite for adapting personal discoveries to existing systems

--Developing the training methods required for schooling others in the use of your tools and knowledge.

Utilizing your discovery in cultural projects and on-going institutions:

--Developing a monitoring system for identifying the career of your discovery (tool, procedure, conduct) in its use in the project or institution

--Developing a modification system for reestablishing the integrity or modifying the integrity of your discovery in its use in the project or institution

--Establishing an informational system by which others who use your discovery can inform you of its utility in a language that allows you to refine the existing discovery to meet new problems.

COMPETENCY-BASED EDUCATION: EDUCATION FOR SKILLS

B. Competency-Based Education: Educating for Skills in the Discipline

Every discipline in our framework of cultural arts and sciences has procedures, such as those listed above, which organize human abilities in a manner that will allow for knowledge acquisition, production, and utilization. The procedures of a discipline in Art, Philosophy, Physics, or Zoology express human abilities when a person actualizes the procedure for some purpose in his environment. However, many procedures of inquiry and resolution which are identified with specific disciplines are so encrusted with special terms and narrow usages that the generic human abilities which underlie them are lost to consciousness. Rote ritual ensures rather than a flexible pursuit of human knowledge and accomplishment.

Every procedure in a discipline should be taught in a manner that enables the learner to see how the function of that procedure exists in the methodologies of other disciplines. Helping the student to learn procedures which can be used in several fields clarifies the universal significance of inquiry and experimental methods. Individuals learn that the methods of the sciences are similar in every discipline because of the conditions of the human search in the world.

A procedure becomes a skill when it is a conscious, flexible tool for conducting the basic operations involved in the acquisition, production, and utilization of knowledge. A skill is a procedure which organizes human abilities in an effective manner for life in the world. Developmental education seeks to identify the skills required for effective life in professional and non-professional settings, and the skill levels adequate for functioning at certain tasks in the various life stages. Developmental education is concerned with the broad range of human abilities which are expressed in every particular skill.

Competency-based education is teaching that seeks to identify the skills required by a discipline, sets performance objectives in those skills to be demonstrated by the student, and provides learning and demonstration opportunities in which the skills can be acquired and exercised. Let us look at the skills of historical judgement which might be the competency objectives of an introductory history course. Below is a problem given to students in the history course: Determine to your best knowledge why Abraham Lincoln became a lawyer! In resolving this historical problem many skills will be used by the student. He will get help from his instructor in the development and exercise of the procedures he must employ in solving the problem. The procedures he uses will be perceived as skills as he learns how their function in the acquisition, production, or utilization of knowledge occurs in other fields.

Below is an outline of the skills of historical judgement which a student would use in answering the problem of Lincoln's motives in becoming a lawyer. These skills will be viewed in three categories: as skills (that is, clarified procedures which can be extrapolated from the problem and used in other historical and non-historical problem-solving; as clarified procedures which can be recognized in other disciplines); as procedures which are expressed in terms of the materials and acts which make them up; and as human abilities which underlie them.

Problem: Determine Why Abraham Lincoln Became a Lawyer

Sequential List of Skills/Procedures/Human Abilities

Skill	Procedure	Human Abilities (Selected)
1. Locate information sources to explore the field to which problem belongs. (Acquisition skill)	1. Locate primary and secondary materials on Lincoln's life.	1. Cognitive: making judgements about sources recognition of relevant materials. Psycho-physical: translation of mental mapping to intentional action. (The search process)

Skill	Procedure	Human Abilities
2. Learning information in field to which the problem belongs, and integrating the data into comparative systems of knowledge: (Acquisition and production skills)	2. Studying Lincoln's career as depicted in the primary and secondary materials.	2. Cognitive: reflection convergent thinking imagination
a. and b. and c. Developing a semantical and snytactical range of persons, places, and things which will identify and order the elements of the problem, and serve as the elements of the problem's solution.	a. Acquiring familiarity with persons in Lincoln's life prior to his becoming a lawyer.	a. Establishing temporal-spatial continuum of Lincoln's relationships.
	b. Acquiring familiarity with Lincoln's interests, values, and projects prior to his becoming a lawyer.	b. Establishing temporal-spatial continuum of Lincoln's person in life.
	c. Acquiring familiarity with geography, demography, and economic-political-social facts of Lincoln's time prior to his becoming a lawyer.	c. Establishing temporal-spatial continuum of Lincoln's time.
3. Searching for trends in the data which will delimit the scope of the problem (within the known range), which will provide the elements for a hypothesis of solution. (Production skill)	3. Determining the skills, values, and interests which may be the critical factors in Lincoln's decision to become a lawyer.	3. Cognitive: judgement divergent thinking focused imagination
4. Analogical construction of time-space plausabilities which correspond to personal notions of reality. (Production skill)	4. Picturing Lincoln in various situations with varying interests, values, and intents.	4. Cognitive: judgement empathic prediction focused imagination divergent thinking

Skill	Procedure	Human Abilities
5. Critical review of analogical plausabilities based on analysis of personal biases which may have falsified the constructs. (Production skill)	5. Review of plausability of Lincoln scenarios based on analysis of personal biases which may have distorted analogies.	5. Cognitive: Analysis Comparison Empathic prediction
6. Establish hypotheses which can serve as a solution to the problem. (Production skill)	6. Determine a set of reasons which include Lincoln's interests, skills, and values, and, the human and material settings in which Lincoln lived, which may explain Lincoln's choice to become a lawyer.	6. Cognitive: Judgement Synthesis-Inference Empathic prediction Affective: Identification
7. Verify the actuality of the hypothesis. (Production skill)	7. Predict events in Lincoln's life after his becoming a lawyer which can be inferred from the hypothetical construct of his skills, interests, disposition, and manner of life decision.	7. Cognitive: Deduction Empathic prediction

(By the way: The hypothesis I formed to answer the problem was that Lincoln's facility in communicating person to person data he had interpreted and organized into convincing stories, an art he practiced best under stress situations, led to his choice of being a trial lawyer, given the vocational opportunities of his day.

The hypothesis seems to hold.)

The above trichotomy of skill, procedure, ability cluster serves to develop competency-based instruction in every discipline. Performance objectives can be sought in students. Teachers can develop curricula which demonstrates procecures essential to knowledge acquisition, production, and utilization while generalizing the skills to other fields. Special activities can be developed for furthering the complex of human abilities which underlie specific skills/ procedures.

Such a program of studies is ideal for remedial (basic), general education, and advanced levels of college studies which have an end of developing a competent person in life. Moreover, a college that seeks to create an interdisciplinary study than the methodologies of knowledge acquisition, production, and utilization which can be compared and contrasted in the several fields. Information and ideas are not excluded; information and ideas become tools in themselves for applying the knowledge of the field (s) in pursuit of personal interests, explorations, and problem-solving.

A competency-based program of studies which follows the trichotomy of skills-procedures-abilities can inform the student of a personal profile of skills which can become a life-long identity factor. The entering freshman can use this skill profile to plan a future program of studies, comparing his profile to the trichotomy of competencies which are included in each course (such an inventory of existing course competencies will be prepared). The student who needs remedial help can do so in a program of competency development which makes his skill needs an integral part of his future growth, thus, resolving the stigma now attached to remedial education. Remedial development, without the continuation of competency-based learning on general education and advanced levels is a road going to nowhere.

The freshman and sophomore who perform at general education levels can ground himself in competency-based studies which give him threshhold skills in the Natural Sciences, Social Sciences, and Humanities. The procedural competencies in these major areas of learning are then used in more and more complex combinations, with content area specialization, as the student moves beyond the General Education requirements to advanced studies. A competency-based program over four years of a college education can enable the type of individual research and experimentation buttressed by a broad range of procedural tools drawn from the Social Sciences, Natural Sciences, and Humanities, which can transform thematic interests into an almost professional field. (I am suggesting that just as medical schools have a five year program which includes college and medical school, speeding up the learning process according to course selection on pragmatic criteria, a competency-based program can develop research and experimental competencies in a shorter time than a normal program of studies in which the procedural competencies of the discipline are neglected in favor of a cornucopia of courses organized by theme only.)

The common academic course is not competency-based, although it almost always contains many competencies. Subject matter and unclarified technical procedures are traditional objectives in courses that range from Art History to Zoology. The trichotomy of skill-procedure-ability, although included in the activities of the course process and content as inevitable presence given the human pursuit of knowledge, nevertheless is neglected as an instructional objective. The production of student thought in verbal and written forms is expected; the skills required for thought and creation are assumed, but not guided in special activities for skill development. Competency-based courses would seek to have the same output of student thought and creation, but not only

the products will be of importance and assessed for their quality, also, the skills which effect thought and creation will be developed and assessed for their quality, also, the skills which effect thought and creation will be developed and assessed for their quality. Life-long learning and creativity requires such nourishment and consciousness of skill development.

The Scope of a Competency-Based Education in the University College

University College has a unique role within the University: to provide a comprehensive educational program, open to all. It should attempt to meet the developmental educational goals: To educate competent individuals who have a balanced range of life skills in the acquisition, production, and utilization of knowledge, both information and procedures.

The University College should develop competency-based educational opportunities at all levels within the educational program. These educational opportunities may take several forms:

1 - Skill development laboratories which enable students to concentrate on basic information and procedures which can raise them to basic proficiency levels in the acquisition, production, and utilization of knowledge demanded by freshman level college courses.

2 - Skill development laboratories which enable students to concentrate on information and procedures required to support the ability for independent study in general education and advanced courses.

3 - General education and Advanced Course-Labs which are competency-based within a discipline. The student explores the procedures and ideas of a discipline according to specific behavioral objectives. The course-lab division permits intensive methodological exploration which can support future independent inquiry. Such course-labs may exist within the Social Sciences, Natural Sciences, and Humanities.

4 - Independent Competency-Based Studies leading to degrees within the University College. Students contract for a course of studies which are pursued according to competency-based goals of knowledge acquisition, production, and communication. This form of study can be organized around themes and disciplines of interest to the student, and developed within independent projects, laboratory work, and course participation in which the instructor and the student agree upon performance objectives.

Basic (Remedial) Development

On the Basic Level of student proficiency, which we define as competencies in verbal, quantatative, research and study, and communication skills inadequate for entry level to General Education courses, the instruction of students in competency-based laboratories is the most effective means for raising skill levels to required proficiency. Such laboratory learning will be of two basic types: 1) auto-tutorial, programmed instruction in the information and basic procedures of the skill area; 2) Teacher directed classes for small groups of students in the applications (problem-solving) of information and procedures in the skill area.

The verbal, quantatative, research and study, and communication skills developed in the Basic Level labs are elementary to the skills which are later grouped under the procedural domains of knowledge acquisition, production, and communication at General Education and Advanced Study levels.

General Education Level

General Education courses within the University College will be requested to determine competency requirements for entry and exit levels over the span of information and procedures which encompass the methods of knowledge acquisition, production, and communication in that subject. The Developmental Education Center staff will help teachers with the establishment of competencies in the subject matter and methods of the particular course across the many procedures which may be part of that course. Not every teacher thinks of a course in terms of behavioral objectives, or, actual competencies in information or procedure.

The Developmental Education Center of University College will run awareness sessions and workshops to enable teachers in the Humanities, Social Sciences, and Natural Sciences to determine entry and exit levels in the competencies of their course, instruct for competency development in information and procedures according to the procedural domains of knowledge acquisition, production, and utilization, and to plan courses that may benefit from a course-lab structure.

The present theory of General Education courses is to prepare the student in competencies required for Advanced work in the Humanities, Social Sciences, and Natural Sciences. This is a misnomer as now practiced for no actual competencies are defined in most areas of Humanities, Social Sciences, and Natural Sciences. We feel that an accurate behavioral determination of the

skills of knowledge acquisition, production, and utilization will more efficiently and thoroughly prepare students for the independent thought and study which should increasingly characterize advanced work in higher education.

General education courses can be seen as a transition phase in the use of the procedures for higher learning, and the gradual personality balance needed for independent studies whose end is exploration of life as well as preparation for it. Therefore, as a transition phase of studies and competency development, accurate identification and effective instruction of the necessary information and procedures requisite to higher level studies is the prime goal of this educational level. How this identification of competencies is made and instruction in the competencies is delivered may vary. At this time in our culture, such competency-based learning is in its experimental years.

Several forms of instruction may be effective for competency development at the General Education level according to present awareness of the learning practices of competency-based skill development. One is the use of the skill development laboratory in its auto-instructional, programmed learning units to develop skills in knowledge acquisition, production, and utilization that support projects in General Education courses which do not have the time or syllabus that concentrates on the needed procedures or information. A second form for furthering competency development would be to create course-labs which introduce the Humanities, Social Sciences, and Natural Sciences as fields of information and procedure. LBST 101 will function as such an introduction to the Social Sciences and Humanities in the future. In such a course-lab the basic methods for developing informational and procedural competencies which characterize the several disciplines in these traditional domains of knowledge will be carefully realized. A third form of instruction at the General Education

level may be the problem-solving lab, run by a teacher, graduate student, or Senior level student, who leads small groups of General Education students in the application of procedures and information in probelm-solving modes relevant to a discipline. Such a laboratory course would be available for the use of one or several professors who held General Education courses which did not concentrate on problem-solving laboratory to aid his students in applied problems. Credit for such work could be arranged as an additional unit before course registration or in terms of compensating for other assignments in the course.

A fourth form would be independent study according to a student contract with an academic counselor responsible for this program in the University College. Independent studies which are competency-based, and, possibly, thematically organized, will be possible for the General Education student after introductory instruction in procedures and information basic to the Natural Sciences, Social Sciences, and Humanities (currently LBST 101, Math 101, and Natural Science 101) directed to the essential procedures and information which may enable independent studies in these fields.

Independent studies in General Education will be supported by advisors who are professors in the disciplines explored as part of a student's thematic program. This advising will be a part of the duties of a full professorial load which is planned for carrying x number of Independent Studies students. Such a program of Independent Studies at the General Education level may be most effective in an interdisciplinary framework where a theme of interest to the student is pursued over the Humanities, Natural Sciences, and Social Sciences. In fact, required pursuit over these three domains of a particular theme, involving several

disciplines in each broad domain, will thoroughly school the student for Advanced Independent Studies which may become more specialized. For example, Death and Dying may be a thematic area for development in the informational and procedural competencies of Humanities, Social Science, and Natural Science domains. Human Identity, as a thematic area, can be productively explored over the three major domains of our knowledge structure in such informational and procedural disciplines as Sociology, Literature, Biology, Psychiatry, and Logic. The catalogue of Great Ideas can function over the three domains of knowledge, as well as problem statements of the individual in relation to society and the environment.

Advanced level

Present study for individuals who progress beyond General Education courses is gradual specialization in a major field. The language of the field, the methods of determining facts on nature and man peculiar to the field, and the perspective inherent to the field, become an integral factor in the student's consciousness of himself and life in the world.

Be it Sociology, Physics, Literature, or Geology, the major area begins to be a station of knowledge in which the student's skills and outlook are molded. Alas, it is at this point of hardening of perspective and definition that a skill becomes a rigid procedure which loses its transferability to life outside the discipline. It is at the point where the student identifies with a discipline that human competency becomes memorized routine in the special methods traditional to the field.

Jonas Salk can make contributions in Biology and Education, because he is able to exercise the methods of knowledge acquisition, production, and utilization

in these fields in a facile manner, unencumbered by the limitation of either field's parameters, in which these methods establish facts and open areas for the testing of data. A procedure within Biology is never limited to Biology for Salk: It is a method either for generating a fact, developing a problem statement, establishing a type of hypothesis, conducting a controlled experiment, a useful measure forverification, or comparing results to a known body of knowledge. Thus, for Salk, the procedures of Biology are not lost in the body of biological language and history of its special procedures, rather each method is itself a transferable skill to new areas of questioning outside the discipline. Similarly, Salk is able to borrow comparative methods from other disciplines, history and sociology, in order to review biological facts and extend biological knowledge to the field of education.

Advanced levels of education in the University College should seek to educate the student towards Jonas Salk's ability to use the information and procedures from various disciplines to address the real problems of being human in the contemporary world. The perspectives of the Humanities, literature, logic, writing, languages, and philosophy, offer certain scientific windows on experience, methods for establishing facts, procedures for organizing and communicating knowledge which differ in value and utility from the Social Sciences or Natural Sciences. And, correspondingly, the scientific windows of the Social Sciences and Physical Sciences offer critical perspectives and methodologies for grasping reality, relating fully in life, and solving human (and non-human) problems vital to life in the world.

Interdependence should not be incompetence in certain areas of thought which require being a passive dependent on the "answers" of someone else because he is

a "specialist". Each citizen of the 20th century must be able to appreciate reality and cope personally with the physical world, the world of the mind, the world of society, the world of the body. We should all be competent in the perspectives and methods of the Natural Sciences, Humanities, and Social Sciences to the degree in which we can have a well-rounded relation to the world in terms of the "facts" of each of these domains.

Interdependence should be mutual cooperation on common projects. "Life in America" certainly offers enough projects in the human domain for the next 100 years.

Thus, a program of studies at the Advanced Level in the University College should permit a student to specialize, but with a careful regard in each course or path of independent studies in the discipline toward enabling the student to use the procedures and information of the discipline in a broad, practical manner which links scientific activity to life in the world. Knowledge acquisition, production, and utilization in a discipline should be self-consciously open and able to borrow "other" methods and information from differing disciplines.

Interdisciplinary studies, then, is a constant requirement for a balanced individuation in the pursuit of knowledge. And, interdisciplinary studies must be detailed enough in the procedural domains of knowledge acquisition, production, and utilization in each academic discipline to provide real methods for cross-fertilization of fields and tools can be used in inquiry into, and solution of life problems.

Advanced Level Interdisciplinary Studies Based on Competency

A student who has moved from the General Education level to the Advanced Level will have been grounded in elementary procedures of knowledge acquisition,

production, and utilization in several fields on the bases of thematic studies or simply an exposure to the methods of Natural Sciences, Humanities, and Social Sciences. At the Advanced Level a student whould concentrate on the ideas, methods, and history of procedures and theories of a specialized field or two fields. However, in every project given within a course (or program of independent studies within the major) the student should be challenged to develop problem statements which require methods of inquiry, solution, and communication from other disciplines.

The Developmental Education Center will provide students at the Advanced Level with help in supporting their projects with methods of knowledge acquisition, production, and utilization which are necessary for extending the discipline's horizons to other disciplines, or, giving the student the resources and time to deepen knowledge of procedures and information within his field.

This support will be accomplished by enabling the student to define the particular competencies he needs for his work in the field. The student will be aided in viewing his thought and work in terms of the particular competencies he is exercising, the competencies he needs next in his scientific endeavours, and the competencies which he may seek from others in a cooperative task.

Similarly, a professor in any discipline on the Advanced Level in the University College will be aided by the DEC in isolating the various procedures and information that relate to knowledge acquisition, production, and utilization in his field so that entry and exit competency levels for his discipline may be established. Additionally an effort will be made by the Developmental Education Center to create an inventory of procedures in the major disciplines of the Humanities, Natural Sciences, and Social Sciences, with the consultation of

professionals in the various disciplines, which reference methods of knowledge acquisition, production, and utilization. Such a reference source will help students seek the type of method required for any stage of inquiry into a problem whose horizon can benefit from interdisciplinary cross-fertilization.

The several forms of competency-based study that can be pursued at the Advanced Level of University College courses include:

1 - The Developmental Education Center will provide informational and procedural support for students who seek interdisciplinary or specialized methods for their studies in an advanced course. This supportive opportunity can be arranged with a professor of an advanced level discipline before a semester. Ideally, the research projects intended by a professor will be studied in terms of the information and procedures they entail or could entail. Competency levels and types of competency would be determined, and the range of help the Developmental Education Center could provide students in the course would be established.

2 - Advanced course-labs in a discipline or disciplines (specially focused interdisciplinary studies) would be developed in cooperation with the Developmental Education Center where two or three professors representing various fields, and staff of the Developmental Education Center, would explore a problem or theme in culture, engaging students in the methods of inquiry and solution derived from their various fields. The Developmental Education Center would help students focus on the use of procedures in the several fields to sharpen competency. The professors would be freed, thereby, to guide the information acquisition and monitor the actual research of the

students in the probelm or theme the course is based upon. For example, in an interdisciplinary exploration of the effect of epidemics on human culture, a biologist, an historian, and a sociologist would combine efforts with the Developmental Education Center. The theme of epidemics in history and their effects on the value structure, economics, and politics of societies would be explored by the historian in lecture, readings, and discussion; the sociologist would develop awareness of the macro and micro behaviors involved in disease outbreak and disease control, and the biologist would explore with the students the etiologies of various types of epidemic diseases known to the societies discussed, and questions of medical immunology. Research papers that required an historical, sociological, and medical knowledge of various diseases and their control would be assigned.

The Developmental Education Center would aid students in framing historical problem statements, sociological problem statements and medical problem statements. Procedures for producing and communicating knowledge in the three fields would be reviewed in the DEC, so that a student might write a paper which was sound in the three areas. Review of styles of information communication and theory application, more intensive than permitted in the lecture-discussion component of the course, could be designed by the Developmental Education Center in audio-tutorial formats, or other means of presentation.

3 - The developmental Education Center can be a resource for students pursuing Advanced Level independent studies. Specializing in the history of procedures of knowledge acquisition, production, and utilization in the major disciplines of the Humanities, Social Sciences, and Natural Sciences. The DEC will be engaged in an on-going creation of libraries of methology which can benefit the pursuit of independent knowledge.

C. DEVELOPMENTAL EDUCATION AND THE UNIVERSITY COLLEGE: STRUCTURE AND SYSTEM

To facilitate the restructuring of education along the lines discussed above, it is necessary to create more flexible means of structuring educational experiences than are possible in a traditional setting. The proposed structure of the Developmental Education Center presented here should, we believe, enable this restructuring to occur in a controlled setting. The structure is presented below in two parts: first, the modular composition of the program and, second, the overall design of the system into which the modules fit.

Modular Structure

What Modules Are:

The basic instructional unit of the DEC is the module. A module is, by definition, an educational experience designed to produce competency on the part of the student in a specified number of procedures and/or a body of information.

Methods of instruction will vary according to the objectives of each module, as will the length of time required to complete the module. The specific means used for each instructional module will be determined by:

1 - the nature of the skill to be developed

2 - the current level of skill development

3 - the academic activities to which the skill is related

4 - the availability of resources (hardware, software, staff)

5 - transition between preceeding and following modules

Moreover, the program demands that every module be replicable, that there be a careful statement of entry level knowledge for students working the module, and that the objectives of the module be tested before a student exits from it.

Some hypothetical modules.

To better clarify the modular concept, we present here rough descriptions of a few modules:

1. Basic level mathematics module designed to enable a student to add, subtract, multiply, and divide fractions. Required entry level skills: ability to add, subtract, multiply, and divide integers. Competence in entry level skills determined by (1) mathematics diagnostic test, (2) completion of previous module in mathematics sequence, or (3) short entry level test which is part of the module file. Instruction: auto-instructional exercises and procedures: filmstrip tape explanations, CAI drill. Competency examination at end of module: paper and pencil test in solving problems. Approximate time for completion of module: 10 hours. Module value: 1/4 credit (non-degree). No staff necessary other than learning laboratory supervisor. Final examination administered by learning lab supervisor.

2. General level research skills module designed to enable a student to use the library to prepare a bibliography of materials to be used for the solution of a given problem. Required entry level skills: ability to plan and order individual tasks within a complex activity, basic reading level, ability to classify, ascertained by a short entry level test. Instruction: teacher-directed class augmented by videotapes demonstrations (using the card catalog, using the reader's guide, using standard bibliographies). 2 week unit; students meet as group for six one-hour sessions; 6 hours videotape demonstration. 8 hours outside library work. 1/2 credit (degree). Supervisor must be familiar with research methods, library. Final examination composed of short test and completion of assigned projects. All activities for six one-hour sessions completely described, all outside projects deliniated.

3. General level natural science module designed to acquaint a student with current knowledge in physiology, specifically the workings of the reproductive system. Entry level abilities include knowledge of the procedures used to discover knowledge and analyze facts, produce theories in the natural sciences, determined by tests or the completion of previous modules. Instruction: audio-visual self-paced instructional units used by students, lectures intergrating and reviewing materials illustrating principles with slides by teacher experienced in biology. Approximate time for module: 10 hours self-paced A-V units, 5 hours reading, 5 one-hour lectures. Competency determined by final examination. 1 credit (degree). (this is basically identical to the LBST A102 proposal by Dr. Noland.)

4. Advanced level module designed to teach a student how to write computer programs in BASIC. Entry level abilities: mathematics ability through introductory algebra, ascertained from skill profile. Instruction: complete 10 hour CAI course, with built-in tests; completion of courses is a certification of competency. Credit: 1/2 credit (degree). Module may be used as part of any existing course which requires students to learn this research tool.

5. Advanced level module designed to enable student to do individualized background reading in a specific interdisciplinary thematic area. Entry level: basic courses in all disciplines on which theme is based. Instruction: student reads all books listed on bibliography prepared by course director, joins group discussion with other students working in module for one hour each week to discuss books read. Formal meetings for module: one hour each week for fifteen weeks. 1 credit. Final examination ascertains that student has read all books.

How modules will be used

First, existing whole courses can be thought of as modules. Any existing course attempts to teach some group of procedures or some body of information. Unfortunately, existing courses depart from the idealized modular concept in several ways: they are not always highly replicable, they do not always clearly identify their objectives, they sometimes mix objectives without regard to the concept of developmental stages. Moreover, many existing courses attempt instruction in a large number of procedures and a large body of information without separating stages; students may learn some of the procedures or some of the information, but the grade for the course evaluated their acquisition of all the procedures and information.

There are various ways of dealing with these problems--of making existing courses more closely approach the modular ideal, and thus share in the many benefits produced by modular structure. First, a complex course could be broken down into a series of independent, ordered modules, each fully described and accompanied by stated entrance and exit levels. This, in effect, is how the modules will be used on the basic level: as a series of incremental steps designed to enable the student to acquire a basic skill or body of information.

In order to accomplish this, initially modules dealing with the progressive development of related skills will be organized into clusters. At first, these clusters will correspond closely to traditional areas of academic activity: mathematics, communications (both oral and written), research skills, study skills, natural science, social science, the arts and humanities. As the program develops, a clustering based more on the commonality of skills than on similarities in activity will emerge.

For example, in its early stages the program will design a cluster of modules which enables the student to improve his mathematics skills. This cluster will be more-or-less independent of clusters designed to develop communications or science skills. At a later stage, however, the modules forming these clusters can be regrouped and reordered so that the development of a specific mathematics skill can be quickly followed by the development of science skills using that mathematics skill. Such a program will be truly interdisciplinary.

The modules within each cluster or academic activity area will be ordered developmentally: the student will progress from less complex to more complex skills. Since each module is defined in terms of entry and exit level skills, this ordering of modules is inherent in their structure. However, a separate statement will exist for each skill cluster, indicating the modules constituting it, their ordering, and the final competency requirement the cluster is designed to fulfill.

On the more advanced levels, any existing course which contains within it a clearly identifiable body of knowledge or procedure may formulate that knowledge in modular form: the module can then be assigned as part of that course. (Of course, once the module has been formulated according to the DEC format, it will also be available in the module library for other uses--as a part of other courses, or as a resource for independent study).

A second use of modules is as an accompaniment for existing courses, a laboratory for the development of knowledge not directly taught in normal class sessions. Thus, for example, all students in a social science course could be required, by the teacher, to work simultaneously in a module (or a sequence of modules) which would train them in statistical methodology.

Their acquisition of competency in statistical methodology (or lack of it) would be evaluated by the DEC staff running this "course lab", and could be used in figuring the course grade and credit, or they could be given credit for the lab independently of their evaluation within the course.

A third use could be the prescription of individual modules for individual students by the teacher of a regular course. For example, in an advanced course in health care in which the students were to do research papers, the teacher could prescribe a module in historical research methods for a student who wanted to work on a paper studying the history of epidemic control. This module would provide the individual student with the skills necessary for his individual project, and would supplement his performance within the course. He would receive credit for the module independently of credit for the course itself.

Replicability of Modules

Simply put, replicable modules are ones which can be repeared and reused without new creative effort. One of the major weaknesses in many programs (both traditional and innovative) is that the activities--lectures, discussions, exercises, assignments, etc.--are not designed to be replicated.

For example, a teacher in a traditionally organized class may generate a class discussion in order to introduce or clarify a point. Unless he formalizes, in a replicable way, the method by which he generated this discussion, he will be forced to reinvent a means of generating a similar discussion the next time he wants one. Re-invention is waste. More importantly, other teachers who might want to generate similar discussions will have to invent means of their own. Duplication is waste.

In a replicable program, the goals and methods of every activity are clearly specified, and this documentation is available for everyone. In the example above, the teacher might indicate the point he was trying to introduce or clarify, the materials to which the students should have been exposed before the activity, the skills they already possessed and those he was trying to develop, etc. In addition, a description of the unit would include his means of organizing the class, the questions with which he began, his methods of focusing the discussion, use of media, etc.

Obviously, since "all things are in flux" (including both teachers and students) perfect replicability is not possible. Nevertheless, if the program is to avoid the waste of resources common in many programs, and if it is to ensure an orderly sequence of developmentally incremental educational units, the replicability of each module must be as high as possible.

The values of high replicability are manifold: in a full developmental program, made up of seperately documented highly replicable modules:

1 - The program is not dependent upon staff. A module which requires a director from the DEC can be run by any DEC staff member who meets the qualifications stated. In general, the staffing requirements for a module should be the lowest that will enable the module to successfully fulfill its objectives. A mathematics module, for example, should not be run by a Ph.D in mathematics if it can successfully fulfill its objectives under the direction of a graduate assistant.

2 - The program is revisable. If a module is not fulfilling its objectives, it may be revised. Alternate modules with the same objectives can be designed, and the effectiveness of each can be compared empiracally.

3 - The program can become more and more comprehensive. Once modules are designed, they are perpetually ready for use: they need not be reformulated for each operation. Thus, design time can be used for the production of new modules.

4 - Duplication of effort is avoided. A module library, cross-filed by objective (i.e. the abilities to be developed), procedure, and activity should enable personnel engaged in the design of new modules to avoid re-exploring ground already covered in the design of previously prepared modules.

5 - Alternative prescription to satisfy student needs is possible. With a large stock of modules, one can direct the student to whichever modules best suit him. If alternate modules with identical objectives exist, the student can be directed to one, and the alternatives can serve as back-up.

6 - Overall reordering of sequences is possible. Since each module is clearly described, a sequence can be reordered to ensure that students progress developmentally from one module to the next. Any instructional gaps in the sequence should become visable easily.

7 - Student progress can be traced, and the student can be made clearly aware of how far he has come, and how far he has to go. The student should get a greater feeling of progress than he would in a more informal non-replicable program.

The means to developing highly replicable program modules.

The DEC will establish a module library, containing full information on each module developed and used within the program. The information available for each module will enable that module to be replicated by current or future DEC staff members. Among the documentation contained in the module library for each module will be the following:

1 - A statement of the objectives for the module:
what skills it is designed to develop.

2 - The entry level knowledge required for the module, and how this entry level may be ascertained. (e. g. by a specific test, by completion of another module, etc.)

3 - The DEC staff requirements for operation of the module:
is a DEC leader necessary, and if so, what are the qualifications.

4 - The facilities necessary for operation of the module:
hardware, room requirements, etc.

5 - The software required: specific books, software programs, handouts, worksheets, transparancies, etc.

6 - The time 'normally' required to operate and complete the module (for auto-instructional modules, this should be an estimate of the total number of hours required for completion; for non-auto-instructional modules, it might be a meeting schedule).

7 - A datailed description of all the activities engaged in by students (lecture notes, questions, projects, etc.)

8 - The means used for evaluation: the test which ascertains whether or not students have achieved the objectives.

9 - The credit-value of the module, based on (1) the skills developed, and (2) the time expended by the student.

10 - A check list of descriptors which enables the DEC to access the modules from a variety of dimensions.

One of the tasks of the DEC will be to devise a standard format for eliciting and recording this information, and to devise a standard format for eliciting and recording this information, and to devise a system for retrieval of modules (using the descriptors of #10) for different purposes.

THE DEVELOPMENTAL EDUCATION CENTER: SYSTEM DESIGN

Once it is operating fully, the Developmental Education Center will require the performance of a number of interdependent functions, all of which are necessary for administration, planning, and instruction. The total system can best be visualized, at the current stage of design, by describing these functions individually. It is important to remember, at this point, that no one-to-one correspondance will exist between functions and staff: more than one function may be performed by a single person or gorup of people, and one function may be shared by more than one group of people.

The functions described below are not ordered in terms of importance, urgency, etc.

(a) Deciding on new program needs

(b) Scheduling operations

(c) Administering tests

(d) Creating student skill profiles

(e) Selecting and creating test instruments

(f) Producing modules

(g) Defining student contracts

(h) Evaluating student contracts

(i) Operating modules

(j) Budgeting resources

(k) Evaluating and revising system

For each of these functions, certain information is necessary, operations are performed, and certain results are produced. Each can be specifically described in these terms:

(a) Deciding on new program needs.

Recognizing educational needs; deciding whether needs can be met within limits of resources; specifying needs in exact terms; setting priorities ordering the development of new modules.

Input information:

1. Information concerning current program holdings (i.e. which modules already exist in the module library).

2. Information concerning student needs, gathered from test scores, reports of inadequate competency in general and advanced level courses.

3. Information concerning future college emphasis (e.g. new programs, degrees, certificates).
4. Information concerning requests from teachers for specific 'skill labs' to accompany existing or proposed courses.
5. Information from students who wish to pursue advanced independent study.
6. Budgetary and staffing information.

Output:

1. Specific directives to develop new modules or modular sequences which will satisfy stated behavioral objectives.

(b) Scheduling operations.

Scheduling operations which involve direct student-teacher contact; scheduling the offering of non-auto-instructional modules; fixing laboratory hours for use of hardware and software for auto-instructional modules.

Input information:

1. Information on available resources (i.e. modules which are ready for use).
2. Information on current demand, derived from student contracts, test score summaries, projections from past operations, demand for 'skills labs', demand for individual advanced study.
3. Information on new modules which will be ready for use in the near future.

Output:

1. Student test scores (individual scores)
2. Summary scores and descriptive statistics

c. Administering tests

Giving diagnostic and national tests to students to determine skills; giving national tests to help evaluate programs; giving competency tests to students completing modules.

Input:

1. Tests used within the system
2. Information concerning data necessary for producing student skill profiles
3. Information concerning data necessary for program evaluation.

Output:

1. Student test scores (individual scores)
2. Summary scores and descriptive statistics.

d. Creating student skill profiles.

Producing an inventory of skills, basic procedures, and information in which the student is competent.

Input:

1. Test information and scores
2. Interview information
3. Information concerning the student's particular goals
4. Profile format

Output:

1. New and revised tests
2. Procedures to be followed in testing

f. Producing modules

Gathering information on commercially available modules; selecting commercially available modules usable for program purposes; adapting commercially available modules for use; producing modules internally when no satisfactory module is available commerically; modifying and revising existing modules.

Input:

1. Information concerning commercially available modules.
2. Directive to develop new modules and sequences to meet particular objectives.
3. Reports of the results of using existing modules.

Output:

1. New modules and modular sequences.
2. Revised modules and sequences.

g. Making student contracts

Defining, with the student, an educational strategy which will enable him to acquire the procedures and information necessary; planning exactly what modules he will pursue during a particular period.

Input:

1. Student skill profile
2. Master schedule of auto and non-auto-instructional
3. Modules available in near future

Output:

1. Student contract

h. Evaluating student contracts

Monitoring student progress as he fulfills the obligations laid down in his contract, and, when he finishes, evaluating his overall performance and accomplishment; recommending credit for work.

Input:

1. Student contract
2. Record of student performance in actual modules
3. Student skill profile

Output:

1. Credit recommendations (for student's transcript)
2. Up-dated version of student skill profile (based on accomplishments in modules)

i. Operating modules

Actual operation of instructional units: supervising suto-instructional units, leading teacher run modules. Testing students on completion of module to see if competency has been achieved.

Input:

1. Complete information on modules
2. Schedule of modules
3. Competency tests (part of each module)

Output:

1. Reports on student performance in actual modules
2. Recommendations for module revision

j. Budgeting personnel, money

Determining how people and money will be used (and what future requirements are) for all operations within the system.

Input:

1. Information on all functions

Output:

1. Budget for future
2. Budget report of current operation

k. Evaluating and revising system

Determining how effective the entire system is in accomplishing its goals, and revising the system in any way necessary in order to accomplish these goals more effectively: quicker, cheaper, surer.

Input:

1. Information on all functions
2. Budget report of current operation

Output:

1. Revised system plans
2. Evaluation reports

Student Movement through the System

Like all complex educational systems, students are not directly involved in every function, although every function is necessary to provide the student with the services the system makes available. The interaction of different functions can be best seen, however, by displaying those functions in which students are involved, and then showing how the other functions support these.

The specific functions in which students are involved are:

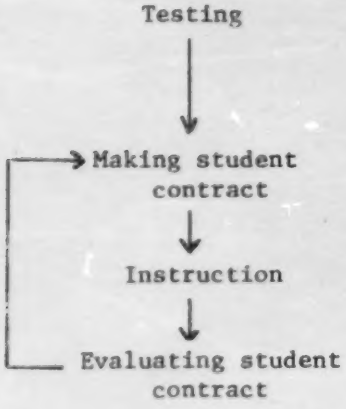
c. Administering tests

d. Making student contracts

h. Evaluating student contracts

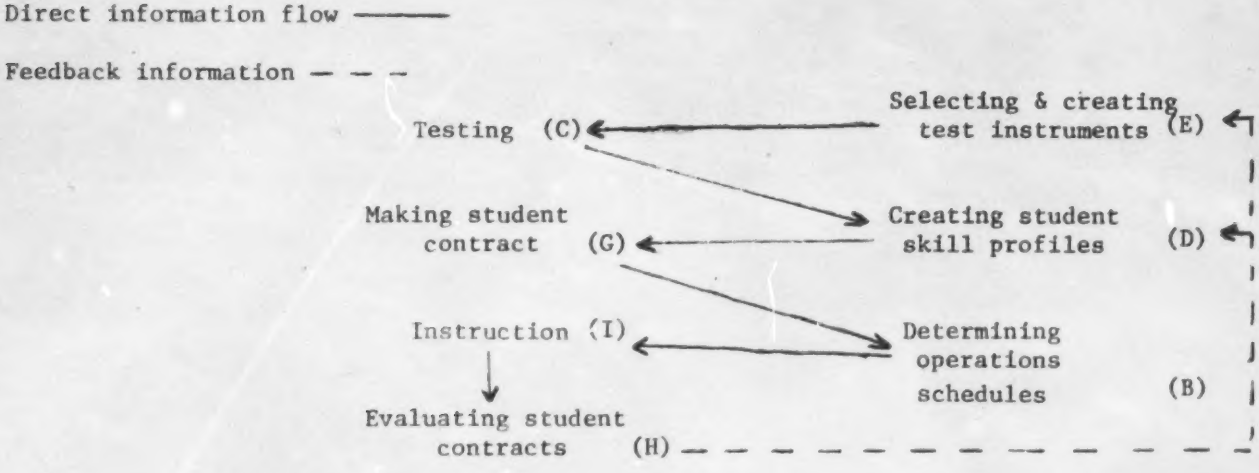
i. Operating modules

C, G, and H are, roughly speaking, counseling operations; I is a teaching operation. The student moves from function to function within these areas as follows:



A schematic description of this movement is relatively simple, although the actual procedures involved are quite complex. The initial stage, testing, introduces the student to the system, and provides the basis for the preparation of a student profile. The profile itself becomes the basis for an initial student contract. The contract specifies the particular modules the student works in. The third stage, instruction, is the actual working in the modules; throughout this stage, the student's progress is monitored, results feed back to the counselor with whom the contract was made, and modifications of the contract are made. Finally, upon completion of the work, the original contract (however modified) is reviewed: credit is given, the student profile is amended, and a new contract for further work is made up. The making of new contracts is a continual process up to the point where the student fulfills his original goals (whether basic, general, or advanced); upon fulfilling his goals, the student moves outside the purview of the Developmental Education Center.

Supporting each function of the system in which a student is directly involved are functions carried on administratively with which the student never has direct contact. Some of these can be shown as follows:

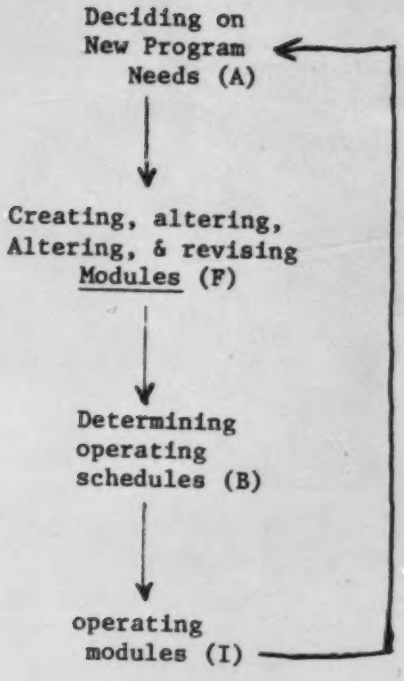


The relations between these functions are in terms of information flow. E, selecting and creating test instruments, provides the tests used in C, testing; which tests are selected and created depends on: information gathered from teachers in general and advanced level courses, indicating specific areas that need intensive instruction; information gathered from counselors based on their experience in making and evaluating student contracts; and information from students concerning their particular college goals (especially on the advanced level). Student contracts are formed primarily on the basis of the student's skill profile, taking into account the scheduling problems of the system; scheduling and student contracting are closely interdependent operations. The scheduling function, B, determines what is to be offered in response to student needs; in doing so, it must take into account (as must the contracting itself) what modules are operational within the system (see next section for module production).

Instruction itself-I-the operation of the modules within the system is determined by the schedule, B. The major information produced is records of student achievement--did the student achieve competency in the task. This information is fed back to the counselor who made and will evaluate the student's contract, and will find its way eventually to the student's skill profile, thus determining the shape of future contracts.

Module production and operation

Much underlies the function I in the previous chart. Which modules are available for the student is the result of an involved planning and production process, with the following functions:


Deciding on
New Program
Needs (A)
Creating, altering,
Altering, & revising
Modules (F)
Determining
operating
schedules (B)
operating
modules (I)

The initial block, A sets directions for the program based on past experience, perceived needs, and future projections. This information comes from within the system (e.g. reports from counselors who may determine future needs of the program from experience with student profiles) and from outside the system (teachers planning new courses which required instruction in particular skills, students planning advanced study requiring particular skills). Deciding on Program needs thus involves looking at those modules currently available and deciding which new ones are needed, then issuing orders to acquire or create the new modules. Experience from actual operation of the program feeds information back which can then be used in planning future directions.

The second block, F, does the actual work of creating the modules, either using externally produced packages or making its own. These modules produced then enter the DEC library, and are available for use in meeting student needs. Each module is filed so that it can be retrieved in a number of ways; each specifies the staff, resources, etc. required for its use. This information, together with information concerning student need (as indicated in test results, contracts) becomes the basis for the operations schedule.

The operations schedule has two parts. Auto-instructional modules, those which the student can work in without human help, are always available from the DEC library; the operations schedule merely indicates laboratory times, laboratory supervisors, and post-test personnel who will coordinate work by students involved in auto-instructional modules. Those modules which require trained instructional staff must, however, be clearly scheduled with times, places, etc., and these must be chosen to maximize utilization by students. The requirements for time and physical facilities are part of the module description available from the DEC library.

I, the actual operation of the modules, follows from the schedule in B. As they operate, results are fed back to counselors monitoring the student's progress as a means of evaluating his contracted performance. At the end of a module's operation, results on its effectiveness also are used to determine new program needs, or to determine whether the module can continue to operate in its present form or needs to be revised. Thus, each module, each time it is run, is subject to review; modules are continually evaluated, and those which are ineffective in achieving their objectives are modified or replaced.

Files and information gathering

This system, complex as it may seem, can be viewed simply in anthromorphic terms. Imagine a potter who takes raw clay, and, turns out finished pots. What enables the potter to do this, what enables him to turn out better and better pots, is what he has learned about pot-making. Seeing the entering student as raw, unfinished clay, the program's task is to help the student acquire those procedures and that information necessary for functioning in the modern world. Like the potter, the system must "learn" about education. Potters learn from formal instruction, experience, etc.; so will this system. "Formal instruction" thus becomes outside resources--commercially prepared programs, systems in existence at other universities, etc.; experience is the results which come about while actually running the program. Both require gathering information and storing it for future use; only in that way can the system build on its own experience.

Budgeting and Program Review

These two administrative functions are not represented on the systems diagrams below because their relations to other functions are all-encompassing. The operations of all other functions concern budgeting, and program review includes everything.

Budgeting, of both people, money, and other resources, will be done in terms of program functions: each function requires a certain staff, certain facilities, and funds. It is important to remember here that budgeting must take into account functions which do not directly involve students as well as those which do; many other such programs have failed or been less than effective because they have concentrated solely on those operations in which the students were involved (testing, counseling and instruction) and have not adequately provided for the support functions which make those operations possible (test selection, development of instructional packages, record-keeping, review, etc.).

Program review, which includes the analysis of how effectively the program was budgeted, is to be done on the following bases: how well was each function in the program performed; was each function necessary; are there necessary functions not now being performed; how are individual program functions interrelated; can changes in program functions be effected; is each function being performed efficiently in terms of budget. Student performance, as measured on national tests, cannot be the sole basis for program review and evaluation: the program goals of reaching competency in methods of acquiring, producing, and utilizing knowledge are not adequately demonstrated on existing national tests. Similarly, student performance in terms of the program's own goals is reached only through a full development of all of the functions of the program; how

these functions are developing must be a major focus of evaluation. Significant changes in student performance may not emerge until the program, as a whole, gains a certain momentum--until a library of modules is available, until staff training methods have been perfected, until counseling, producing skill profiles, making contracts, etc. are all operational. Thus the program must be judged both on the development of these necessary functions and on the actual accomplishments of students who go through the program. Program development, in all functions, should be visible at all times, and can be judged independently of program results as manifested in individual students.

Capacity for Change

On the basis of the experiences of educators in the past, it is apparent that no program, however comprehensive it may attempt to be, can anticipate every problem it will encounter--each student is an individual, and brings with him his own individual strengths and weaknesses, likes and dislikes, interests and aversions. The Developmental Education Center should try to anticipate those problems as clearly as possible, and provide means for effectively solving them, but it must also recognize that there will be unanticipated problems. Thus, the Developmental Education Center should also have, built into its structure, a means for extending its scope so that it may effectively deal with problems it does not presently foresee. For example, the 'remedial' sequences in mathematics, communications, study, and research skill will, at the outset, provide for those students not fully prepared to begin college-level work in presently offered basic courses by establishing prescriptive pre-college level training in basic procedures. Necessarily, these sequences will have to have a starting point, a rough estimate of the level at which most students can begin. Initially, this starting point for the sequence will be determined

on the basis of student need (established through testing and past experience) and available resources. However, as the program develops, this starting point may need to be revised, either because the prepatory experiences of students change, or because more resources are made available to provide help for less and less adequately prepared students.

Similarly, needs for instruction in different areas may change in a way impossible to foresee at the present time. Three years ago, it would have been impossible to predict the need for instruction in the use of hand-held electronic calculators as a basic computational tool in mathematics; today, educators are beginning to realize that such instruction is a necessity. Thus, the Developmental Education Center's initial plan for remedial sequences in four areas--mathematics, communication, research, and study skills--may prove to neglect some area of great need, or it may prove to include areas where the need for remedial work may cease to exist. Likewise, plans for instructional activity on the basic and advanced levels will change in response to changing situations. What is important is that the capacity for such change be an integral parts of both the philosophy of the Developmental Education Center and of the design of its programs.

Implementation

University College has, among the other colleges that form the University of Louisville, two distinctions that make it unique: its committment to 'open admissions,' and its interdisciplinary emphasis, as embodied in its B.L.S. and B.A.S. degrees. These distinctions impose on University College an equally unique responsibility to develop an educational philosophy and design which will reflect the College's special mission and identity. The Developmental Education Center can be a major force in this enterprise, both by defining the competencies which underlie college work in all fields, thus building a truly interdisciplinary foundation for higher education, and by designing and running educational programw which will enable all students, regardless of background, to strive to achieve these competencies.

Ultimately, the goal of the Developmental Education Center is simple: to restructure university education, to focus education on the attainment of competencies, to order educational experiences rationally. To move from the currently fashionable 'subject'-centered approach to true competency-based education will be a difficult task, one that will not be accomplished quickly, or cheaply. The inertia of the present system is enormous; courses are designed, teachers are trained, administrative procedures operate, all in accord with the traditional subject-centered view of education. Therefore implementation of a Developmental Education Center dedicated to a truly competency-based approach must provide a means of transistion for all aspects of the educational process.

Transistion to competency-based education must proceed on all levels: basic, general, and advanced. Although these levels are clearly identifiable in the current university structure, the separation of educational experiences into levels will become less necessary as we move toward a competency-based approach. This should be bourn in mind as we describe implementation activities on each level.

Basic level:

The DEC will begin, in the Spring of 1977, to develop programs to meet the needs of students entering college with competency levels in basic skills inadequate for the demands of introductory courses. It will do this by first defining Skill Development Clusters (corresponding, roughly to traditional academic subject areas on the general level); among these will be clusters in quanatative skills, verbal skills, study skills, research skills, and communication skills. It will then acquire and produce modular sequences which will enable students to attain competency in the skills which make up each cluster as quickly as possible. This will be begun in the following ways:

1 - The design of a modular program in the quanatative Skill Development Cluster, to be ready for operation by Fall, 1977. The sequence will be designed to develop competency in quanatative skills to the level required for successful performance in the lowest level regular mathematics course now offered, Mathematics 101.

2 - The definition of skills for other Skill Development Clusters (defined in conjunction with the definition of competencies for courses fulfilling the 'general education' requirements).

3 - The acquisition of information concerning externally produced programs and modules designed to teach skills from the other Skill Development Clusters.

4 - The selection and design of tests for diagnosing entering skill levels, first in mathematics, then in the skills from other Skill Development Clusters.

General Level:

Theoretically, competencies on the general level are those which the student should have acquired in order to fulfill existing 'general education' requirements. These competencies are the pre-requisits for advanced work. In practice, the courses which may currently be used to fulfill existing 'general education' requirements do not clearly focus on competencies; moreover, the wide choice of courses which may be used to fulfill specific 'general education requirements (e.g. any two of 27 courses will fulfill the 'social science' requirement) effectively obscures the fact that there <u>are</u> general competencies in the acquisition, production, and utilization of knowledge. The sole justification for the existence of requirements is the belief that some common 'core' of knowledge underlies the diverse activities grouped under the names humanities, social sciences, natural sciences. What is required is that students be competent in this underlying core. We believe that this core of knowledge can best be described on a procedural dimension, not by listing a smorgesbord of 'facts' from individual advanced disciplines within an area. Thus, competence in 'social sciences' is an understanding of the methods used by social scientists (no matter what their particular speciality) in acquiring, producing, and utilizing knowledge concerning the structure of society and the activity of

its members. These procedures (for the acquisition, production, and utilization of knowledge) cannot, of course, be learned in limbo; knowledge is unitary, and it is artificial in the extreme to seperate knowing how and knowing why from knowing who, knowing when, knowing what, etc. One can, however, visualize knowledge as multi-dimensional, and approach it from any of its several dimensions. Education can be structured around personalities, the who's, by sequentially introducing students to those who have carried on activities within a given area; around events, the when's, by sequentially introducing students to chronological developments within an area; or around the what's, the facts and theories, by sequentially introducing students to the findings in a given area. All of these are valid approaches to knowledge, particularly on the advanced levels, but on the introductory or general level they can lead to disaster if used as the primary dimension for education. Here, the procedural dimension, the how, is more general and more useful, since understanding how knowledge is acquired, produced and used in an area is necessary as a foundation for more advanced specific study. Other organizations, based on non-procedural dimensions, are more liable to distort or ignore the underlying competencies in an area. For example, it seems unlikely that each of the 27 courses approved to fulfill the 'social science requirement' clearly focuses on the competencies needed by social scientists to acquire, produce and use knowledge; instead, courses as different as 'World Regional Geography (Geography 201), 'Psychology as a Natural Science' (Psychology 201), 'American Political Parties and Elections' (Political Science 203), and 'Perception' (Psychology 331) are likely to be explorations of narrowly defined specialities.

The Developmental Education Center will attempt to identify and teach those general level competencies which underlie the 'general education' requirements,

the competencies in the acquisition, production, and utilization of knowledge which are necessary prerequisites for all advanced college work. This attempt will begin by defining the competencies which should be learned in single course 'general education' requirements (i.e. the exit level for students taking English 102, Natural Sciences 101, Mathematics 101, etc.), and defining the core competencies which should be learned in satisfying requirements where alternatives exist (i e. the History of Civilization requirement, the Humanities requirement, etc.). As these competencies are defined, we can move toward the design of instructional sequences engineered to teach those competencies in the most rational and efficient way possible. Most likely these instructional sequences (either regular courses or modules) will be interdisciplinary in nature, since most of the competencies underlying the 'general education' requirements are basic to several subject areas. Eventually, the Developmental Education Center hopes to provide University College with specific definitions for general competencies, means of testing these competencies, and tried and replicable means of providing instruction for those who have not yet attained them. Beginning the Spring semester of 1977, "Ideas and Research', will function as an experimental setting for the development of replicable methods for teaching methods of acquiring, producing, and utilizing knowledge in the social sciences and humanities. Concurrently, the DEC will work toward defining basic competencies in all areas at the general level, towards acquiring information on externally produced instructional designs for achieving competency in these areas.

One of the ultimate aims of the DEC is to remove the arbitrary distinction between basic and general level competencies. Work on the basic level (in defining Skill Development Clusters and providing means of instruction for

these skills) and work on the general level (in defining necessary competencies in all areas) should eventually merge; we should be able to present the entering student, no matter what his current level of achievement, with a description of the general competencies required for advanced college work, a means of testing whether or not these competencies have been achieved (and, if they have not, with a specific diagnosis of deficiencies), and instructional strategies which will enable the student to progress as quickly as possible from his entering level to the level of required competency. This is the only means, in an open-admissions college, of providing a real educational opportunity for all while maintaining standards.

In summary, immediate activities of the DEC at the general level will be:

1 - The use of LBST A101 as an experimental setting for the development of replicable means for teaching methods of acquiring, producing, and utilizing knowledge in the social science and humanities.

2 - The definition of general level competencies in all areas now included in the 'general education' requirement.

3 - The acquisition of information concerning externally produced materials and programs on the general level.

Advanced level:

Implementation on the advanced level includes all activities designed to focus courses of a more specialized nature on the competencies which underlie those courses. The DEC will begin to emphasize this focus in three specific ways:

1 - The offering of workshops and faculty development seminars to enable teachers to begin to clearly identify the competencies which underlie advanced courses, and to test these competencies objectively.

2 - The desemination of information concerning the use of alternative instructional strategies which may be used in advanced level courses (e.g. auto-tutorial instructional principles and packages, game simulations, etc.).

3 - The design of procedures in which teachers offering specific advanced courses may factor out individual competencies taught in the course and construct replicable modules which enable students to acquire these competencies.

4 - The gathering of information on externally produced modules designed to teach competency in specific advanced skills.

5 - The beginning design of "course labs" to be assigned by teachers in conjunction with advanced courses to improve competency in procedures required by the courses they accompany.

PROGRAM PRINCIPLES

Replicability

All aspects of the program should be replicable: instructional techniques, counseling methods, testing, etc. This requires clear and complete documentation on all procedures to be used within the program, so that any procedure may be replicated for the same purposes with equivalent effects by any personnel trained in the procedure. In particular, there must exist replicable procedures for administering tests, creating student skill profiles, defining student contracts, operating modules, and for evaluating student contracts.

Personnel

All personnel involved in the program should clearly understand its philosophy and operation, and should be trained to carry out their function competently. This requires a training and orientation program for all personnel, careful selection of personnel based on clearly stated criteria for their roles, and regular evaluation. The program should attempt to use personnel as efficiently as possible. In particular, this means using personnel at their highest level of competence, and selecting personnel whose competence is suited for their tasks.

Budgeting

All budgeting should be done realistically, and the use made of resources should be reported regularly and clearly. Reports should indicate monies spent or resources consumed, the intended purpose of the expenditure, the results achieved.

Individualization

The program must always recognize that each student is an individual, with unique strengths, weaknesses, likes and dislikes, and must plan activities to fit the student. The pocesses of testing, creating an individual student skill profile, and of prescribing instruction on the basis of this profile would ensure a program tailored to fit each student. Students should be grouped together and treated similarly only when there is clear evidence that such treatment will be more effective than individual treatment.

Use of Technology

Technological devices (i.e. film, audio-visual equipment, computers, etc.) serve a useful function in education. Technology may make it possible to present ideas and teach skills more effectively than with traditional techniques; similarly, technology can make education more efficient, since the efforts of a single teacher, preserved through technology, may enable the teacher to have a wider and greater impact, to serve more students, than would be possible without technological aids. It is important, however, to remember at all times that technology is a means to greater effectiveness and efficiency in teaching, not an end in itself. The end should determine the means and not be determined by them; the goal of an educational sequence--the information and skills to be taught--should determine the educational methods to be used. We should never allow one method of teaching, whether technological or not, to be used blindly and inappropriately because of fashion, tradition or any other consideration not directly related to the educational goal.

Competencies: ability - procedure - skill

Human abilities are viewed as the bases of history and society as they are exercised in the everyday world. The sequential behavior of purposeful activity is the expression of human abilities.

A full range of human abilities, from cognitive skills of reasoning to psycho-motor skills of coordinating intention and action will be considered in the curricula development of the Developmental Education Center.

The task for developing competency-based curricula on the college level which can be part of the Natural Sciences, Social Sciences, and Humanities studies, is focused by locating the competencies required by these disciplines in their methodologies of knowledge acquisition, production, and utilization.

These methodologies are procedures whereby the individual becomes knowledgeable of the field, learns how to develop facts which can add new knowledge to the field, and becomes adept at using the knowledge in the field for exploring the world, and solving problems which the discipline helps him articulate.

The student will develop in the competency-based program a spectrum of skills which are interdisciplinary and will fit him for acquiring, producing, and utilizing knowledge in his everyday life.

Competency-based courses

Every course now offered in University College will be inventoried according to the skill/procedures it includes in its scope. Cooperatively, the teacher and the Developmental Education Center will articulate the competencies included in the course, and these competencies will be listed in terms of performance objectives for entering students.

The Developmental Education Center will take leadership in providing criterion-referenced tests for measuring entering skill levels in the skills/procedures to be engaged in during the course, and which will serve to measure skill levels upon completion of the course.

The Developmental Education Center and Advanced Levels

The center will provide skill development modules which can further competency development in the basic procedures of knowledge acquisition, production, and utilization in the Natural Sciences, Humanities, and Social Sciences.

This work in developing modules for such competency training will be on-going, and can be facilitated by the input of University College and Arts and Science faculty who share the methodologies of their field, and lend their thought to 1) sequenced competency development, and 2) Criterion-referenced test construction.

Research and Development at the Developmental Education Center

Viewing human activity in the academic world (and in the everyday environment) in terms of abilities-procedures-skills is a relatively new perspective. Few measures exist for skills in the full range of academic and environmental performance, mainly because the combinations of abilities which make up the procedures for coping in the world are too complex for solely paper and pencil testing.

While much work has been done in the identification of skills, their levels, and their measurement in individual performance from the cognitive domain through the psycho-motor domain, much remains to be done. SKills of human performance

are in effect, infinite, as anyone can see who reflects on the moments of his everyday performance. Each moment of intentional action balances the six human ability domains in a cohesive act. Each cohesive act makes up a sequence which may be seen as a measurable procedure if it can be adequately identified.

The ultimate goal of developmental education is not to create a battery of tests and measurements which define and track every human ability in action, but rather to teach students how to define, identify, and assess the skills which make up their own activities, and use this knowledge to support a strong, flexible, and functionally useful identity.

Thus, the activity of the Developmental Education Center will include several programs in research and development:

1 - Defining competencies in the academic disciplines

2 - Developing tests and measures which permit the tracking of skill development

3 - Developing modules for sequenced skill learning in academic disciplines

4 - Enabling students to develop personal skill profiles which enhance individual skill identification and an individuation supported by personal definition (responsibly informed by existing measures).

Tracking Individuation with Cognitive Style Mapping

The uniqueness of a person, and the belief (which we dedicate ourselves to document) that skill actualization is the best evidence of this uniqueness, are fundamental principles in the Developmental Education Center program.

Cognitive style mapping in several dimensions will provide us with individual skill profiles which indicate the unique path of individuation. Such dimensions

of cognitive style mapping as personal communication-response patterns in group discussions, personal preference patterns for research methods and settings, verbal articulation patterns in both the written and oral demonstration of facts and ideas on an individual level, will enable counselors to help students with the fleshing out of an identity profile based on skill development.

Individuation founded upon skill development where the person can track their own self-actualization in terms of many skills and skill clusters can be viewed as the individuality of the future. Cognitive style mapping is a concept which can provide a student with the principles and means whereby personal identity can be responsibly kept informed and available for guiding life choice in a scientific manner.

The metaphorical promises of individuation offered to our culture by the romantic generation of Jung, Hesse, and Miller can be realized now in terms of a concrete assessment of demonstrated and demonstratable abilities-procedures-skills.

Efficiency and Productivity

Efficiency refers to the effectiveness of a given educational sequence; an efficient sequence allows the student to achieve the educational goal more quickly than is possible with an inefficient sequence. Traditionally, efficiency is often thought of as a function of the student-teacher ratio; in such a context, the ideally efficient situation is a tutorial one teacher-one student relationship. Whether, in fact, such a situation is ideal for all educational goals is a valid subject for empirical study.

Productivity refers to the use of resources in the program as a whole; a productive program is one which, with a given amount of resources (people, money, time, etc.), enables a larger number of students to achieve their educational goals than is possible with a less productive program. Traditionally, especially with those viewing education with an industrial model, productivity is a function of the number of students taught by a single teacher; in this context, productive education is festered by large class size, the use of audio-visual substitutes (e.g. video-taped lectures), etc.

Often, in narrow traditional terms, efficiency and productivity are seen as mutually incompatable.

The Developmental Education Center should hold both efficient and productive education as goals, and not see them as incompatible. It should strive for efficiency be selecting the best method with which to reach each educational objective (and not by assuming, in advance, that the tutorial or small group situation is ideal), and for productivity by stressing the development of replicable modules (which can be reused with a minimal strain on resources) and by stressing the careful diagnosis of educational needs, so that students with common problems can be grouped (if group instruction is the most efficient method) in order to provide individually for their needs in a group setting.

The use of tutorial settings deserves special discussion. There are, undoubtedly, situations in which the tutorial is not simply the most efficient method, but the only method; this is especially true on the advanced level for students pursuing independent study. However, tutorial settings, especially on more basic levels, are often simply makeshift solutions for dealing with problems that can be more efficiently and more productively handled in other

ways. The teacher in many tutorial situations must perform two functions simultaneously: diagnosis of the educational problem, and solution (both selecting the means to teach the student, and doing the actual teaching). Having several tutors doing this simultaneously is unproductive: better to establish a means of diagnosis, and invest the valuable time of a professional teacher in developing specific modules which can be prescribed for all students with a recurrent need. With widespread recurrent needs, especially on the basic level, the Developmental Education Center should favor the diagnosis-prescription approach over the tutorial; professional time can be better invested in the development of learning packages than in a haphazard non-developmental approach.